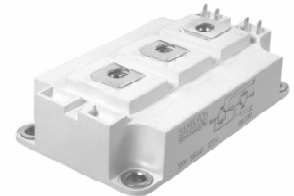


Absolute Maximum Ratings		Values	Units
Symbol	Conditions <sup>1)</sup>		
V <sub>CES</sub>		600	V
V <sub>CGR</sub>	R <sub>GE</sub> = 20 kΩ	600	V
I <sub>C</sub>	T <sub>case</sub> = 25/70 °C	200 / 150	A
I <sub>CM</sub>	T <sub>case</sub> = 25/70 °C; t <sub>p</sub> = 1 ms	400 / 300	A
V <sub>GES</sub>		± 20	V
P <sub>tot</sub>	per IGBT, T <sub>case</sub> = 25 °C	675	W
T <sub>J</sub> , T <sub>stg</sub>		-40 ... +150 (125)	°C
V <sub>isol</sub>	AC, 1 min.	2500	V
humidity	DIN 40040	Class F	
climate	DIN IEC 68 T.1	40/125/56	
Inverse Diode			
I <sub>F</sub> = -I <sub>C</sub>	T <sub>case</sub> = 25/80 °C	130 / 90	A
I <sub>FM</sub> = -I <sub>CM</sub>	T <sub>case</sub> = 25/80 °C; t <sub>p</sub> = 1 ms	400 / 300	A
I <sub>FSM</sub>	t <sub>p</sub> = 10 ms; sin.; T <sub>J</sub> = 150 °C	880	A
I <sup>2</sup> t	t <sub>p</sub> = 10 ms; T <sub>J</sub> = 150 °C	3800	A <sup>2</sup> s

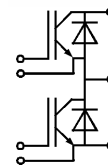
Characteristics		min.	typ.	max.	Units
Symbol	Conditions <sup>1)</sup>				
V <sub>(BR)CES</sub>	V <sub>GE</sub> = 0, I <sub>C</sub> = 4 mA	≥ V <sub>CES</sub>	-	-	V
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 1 mA	4,5	5,5	6,5	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 } T <sub>J</sub> = 25 °C	-	0,2	4	mA
	V <sub>CE</sub> = V <sub>CES</sub> } T <sub>J</sub> = 125 °C	-	5	-	mA
I <sub>GES</sub>	V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0	-	-	200	nA
V <sub>CEsat</sub>	I <sub>C</sub> = 100 A } V <sub>GE</sub> = 15 V;	-	1,8(2,0)	-	V
V <sub>CEsat</sub>	I <sub>C</sub> = 150 A } T <sub>J</sub> = 25 (125) °C }	-	2,1(2,4)	2,5(2,8)	V
g <sub>fs</sub>	V <sub>CE</sub> = 20 V, I <sub>C</sub> = 150 A	50	-	-	S
C <sub>CHC</sub>	per IGBT	-	-	700	pF
C <sub>ies</sub>	V <sub>GE</sub> = 0	-	8400	-	pF
C <sub>oes</sub>	V <sub>CE</sub> = 25 V	-	1000	-	pF
C <sub>res</sub>	f = 1 MHz	-	600	-	pF
L <sub>CE</sub>		-	-	20	nH
t <sub>d(on)</sub>	V <sub>CC</sub> = 300 V	-	130	-	ns
t <sub>r</sub>	V <sub>GE</sub> = -15 V / +15 V <sup>3)</sup>	-	65	-	ns
t <sub>d(off)</sub>	I <sub>C</sub> = 150 A, ind. load	-	450	-	ns
t <sub>f</sub>	R <sub>Gon</sub> = R <sub>Goff</sub> = 10 Ω	-	40	-	ns
E <sub>on</sub>	T <sub>J</sub> = 125 °C	-	8,5	-	mWs
E <sub>off</sub>		-	5,5	-	mWs
Inverse Diode <sup>8)</sup>					
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 100 A } V <sub>GE</sub> = 0 V;	-	1,45(1,35)	1,7	V
	I <sub>F</sub> = 150 A } T <sub>J</sub> = 25 (125) °C }	-	1,55(1,55)	1,9	V
V <sub>TO</sub>	T <sub>J</sub> = 125 °C	-	-	0,9	V
r <sub>t</sub>	T <sub>J</sub> = 125 °C	-	6	8	mΩ
I <sub>RRM</sub>	I <sub>F</sub> = 150 A; T <sub>J</sub> = 125 °C <sup>2)</sup>	-	53	-	A
Q <sub>rr</sub>	I <sub>F</sub> = 150 A; T <sub>J</sub> = 125 °C <sup>2)</sup>	-	8,1	-	μC
Thermal characteristics					
R <sub>thjc</sub>	per IGBT	-	-	0,18	°C/W
R <sub>thjc</sub>	per diode	-	-	0,5	°C/W
R <sub>thch</sub>	per module	-	-	0,038	°C/W

## SEMITRANS® M Superfast NPT-IGBT Modules

### SKM 150 GB 063 D



#### SEMITRANS 3



GB

#### Features

- N channel, homogeneous Silicon structure (NPT- Non punch-through IGBT)
  - Low tail current with low temperature dependence
  - High short circuit capability, self limiting if term. G is clamped to E
  - Pos. temp.-coeff. of V<sub>CEsat</sub>
  - 50 % less turn off losses <sup>9)</sup>
  - 30 % less short circuit current <sup>9)</sup>
  - Very low C<sub>ies</sub>, C<sub>oes</sub>, C<sub>res</sub> <sup>9)</sup>
  - Latch-up free
  - Fast & soft inverse CAL diodes <sup>8)</sup>
  - Isolated copper baseplate using DCB Direct Copper Bonding Technology without hard mould
  - Large clearance (13 mm) and creepage distances (20 mm)
- #### Typical Applications
- Switching (not for linear use)
  - Switched mode power supplies
  - UPS
  - AC inverter servo drives
  - Pulse frequencies also above 10 kHz
  - Welding inverters

<sup>1)</sup> T<sub>case</sub> = 25 °C, unless otherwise specified

<sup>2)</sup> I<sub>F</sub> = -I<sub>C</sub>, V<sub>R</sub> = 300 V, -di<sub>F</sub>/dt = 1500 A/μs, V<sub>GE</sub> = 0 V

<sup>3)</sup> Use V<sub>GEoff</sub> = -5... -15 V

<sup>8)</sup> CAL = Controlled Axial Lifetime Technology

<sup>9)</sup> Compared to PT-IGBT

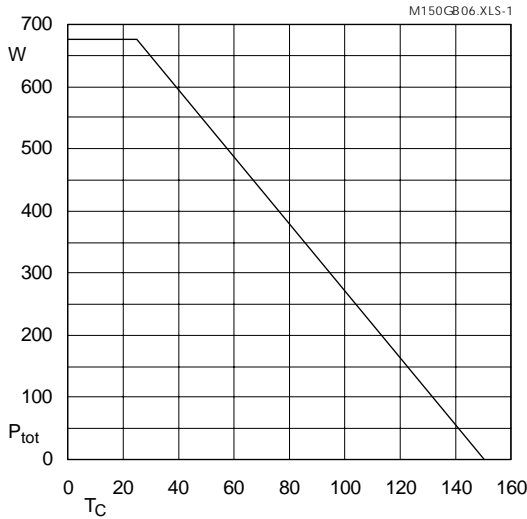


Fig. 1 Rated power dissipation  $P_{tot} = f(T_C)$

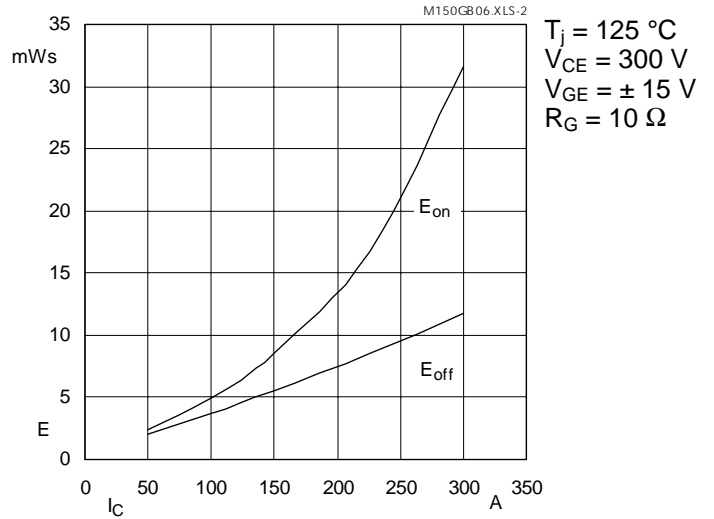


Fig. 2 Turn-on /-off energy  $= f(I_C)$

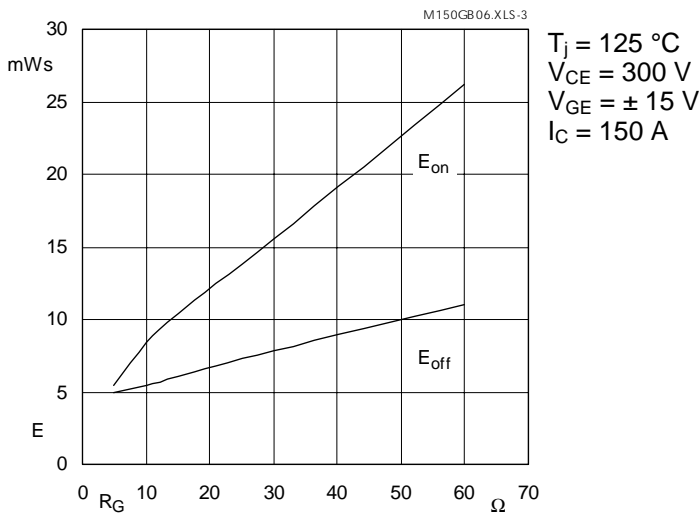


Fig. 3 Turn-on /-off energy  $= f(R_G)$

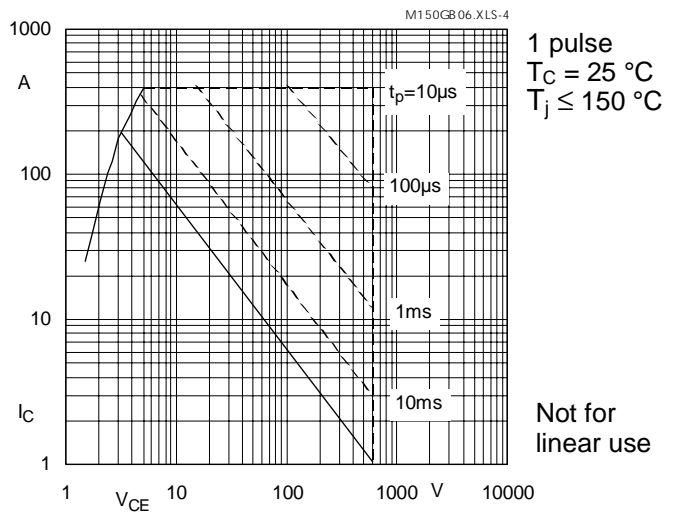


Fig. 4 Maximum safe operating area (SOA)  $I_C = f(V_{CE})$

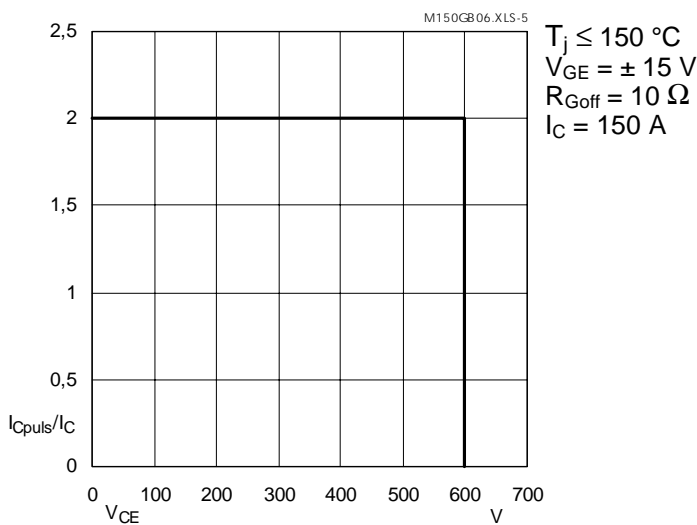


Fig. 5 Turn-off safe operating area (RBSOA)

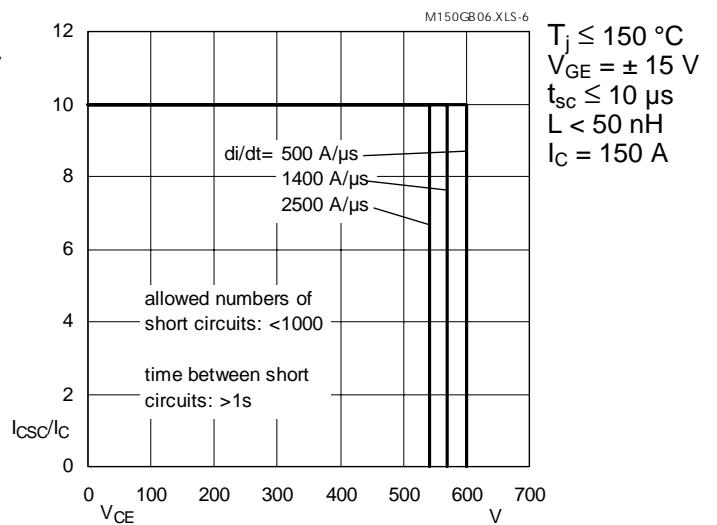


Fig. 6 Safe operating area at short circuit  $I_C = f(V_{CE})$

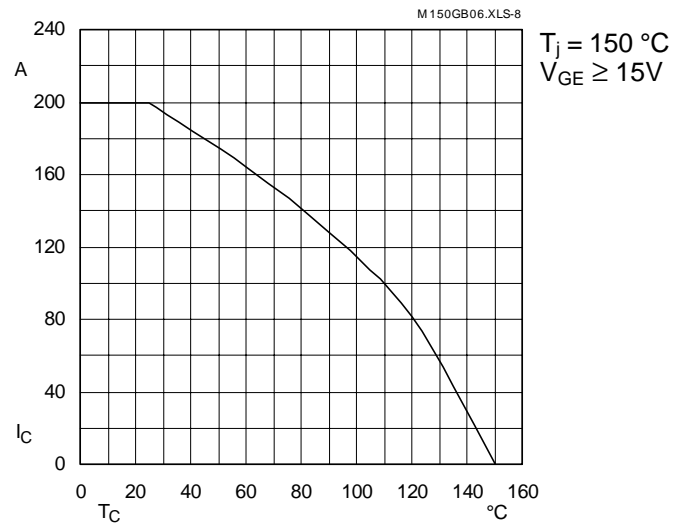


Fig. 8 Rated current vs. temperature  $I_C = f(T_C)$

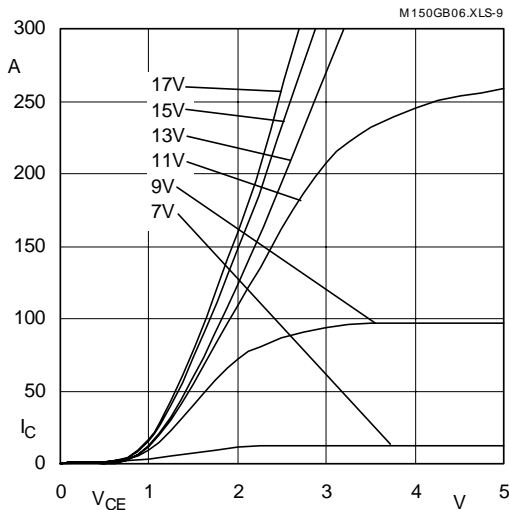


Fig. 9 Typ. output characteristic,  $t_p = 250 \mu s$ ;  $T_j = 25 \text{ }^\circ\text{C}$

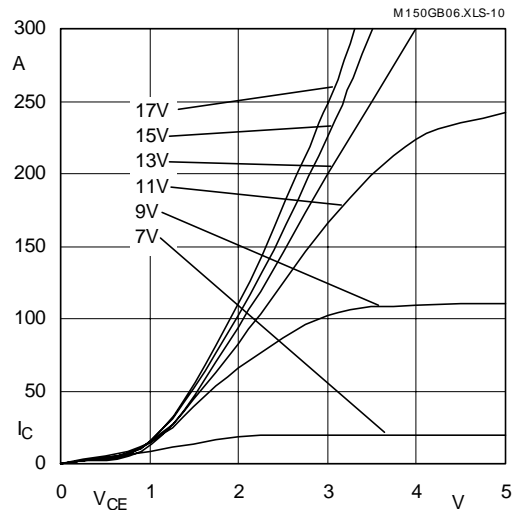


Fig. 10 Typ. output characteristic,  $t_p = 250 \mu s$ ;  $T_j = 125 \text{ }^\circ\text{C}$

$$P_{\text{cond}(t)} = V_{\text{CEsat}(t)} \cdot I_{\text{C}(t)}$$

$$V_{\text{CEsat}(t)} = V_{\text{CE(TO)(T}_j)} + r_{\text{CE(T}_j)} \cdot I_{\text{C}(t)}$$

$$V_{\text{CE(TO)(T}_j)} \leq 1,2 - 0,001 (T_j - 25) \text{ [V]}$$

$$\text{typ.: } r_{\text{CE(T}_j)} = 0,006 + 0,000027 (T_j - 25) \text{ [}\Omega\text{]}$$

$$\text{max.: } r_{\text{CE(T}_j)} = 0,0087 + 0,000027 (T_j - 25) \text{ [}\Omega\text{]}$$

$$\text{valid for } V_{\text{GE}} = +15 \pm 2 \text{ [V]; } I_{\text{C}} \geq 0,3 I_{\text{Cn}}$$

Fig. 11 Saturation characteristic (IGBT)  
Calculation elements and equations

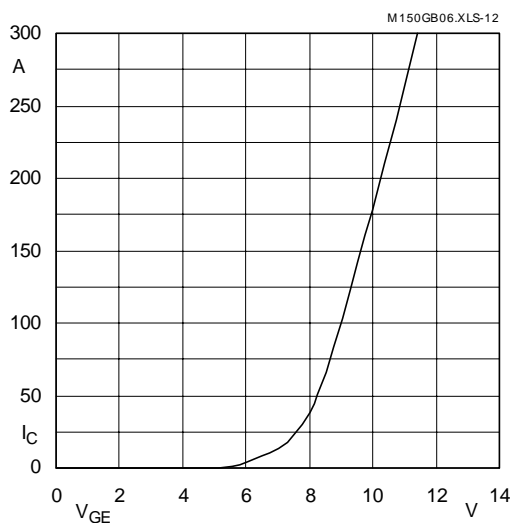


Fig. 12 Typ. transfer characteristic,  $t_p = 250 \mu s$ ;  $V_{\text{CE}} = 20 \text{ V}$

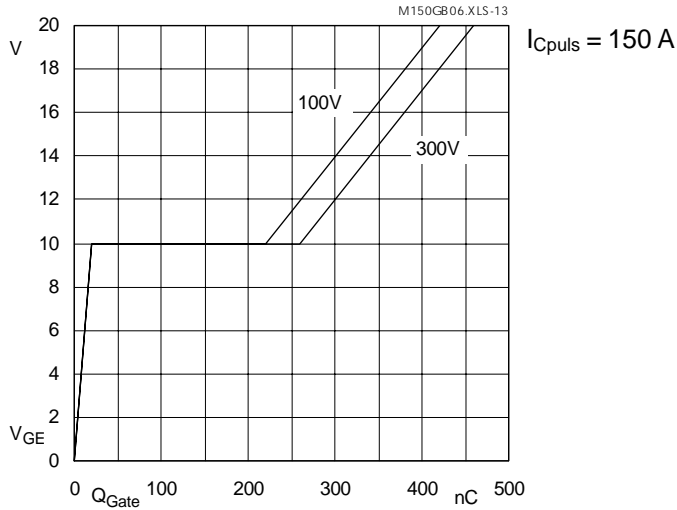


Fig. 13 Typ. gate charge characteristic

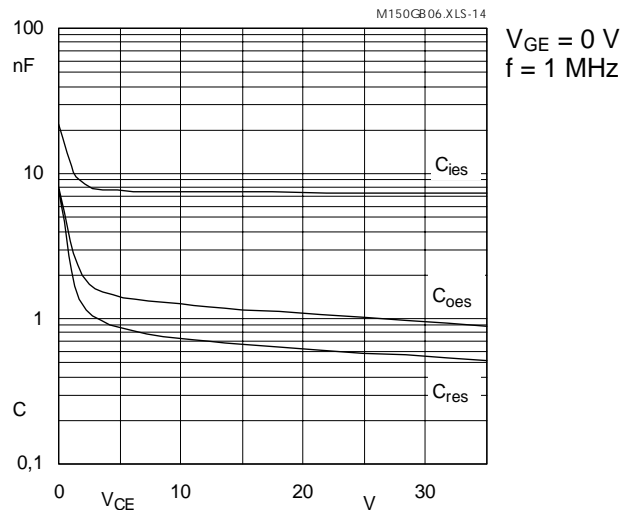


Fig. 14 Typ. capacitances vs.  $V_{CE}$

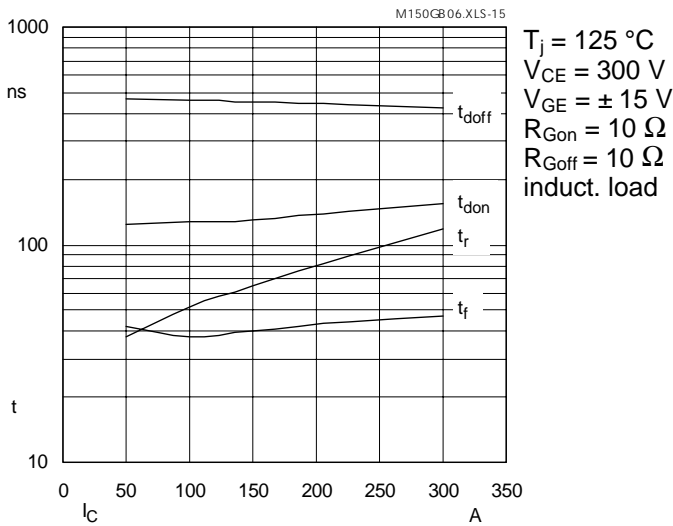


Fig. 15 Typ. switching times vs.  $I_C$

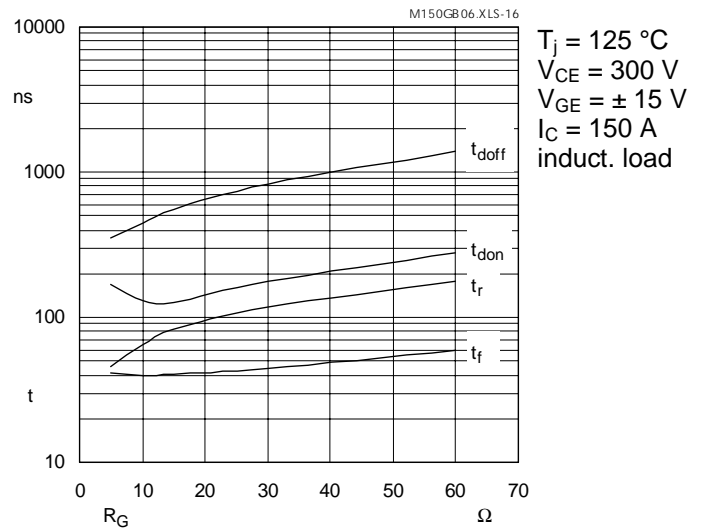


Fig. 16 Typ. switching times vs. gate resistor  $R_G$

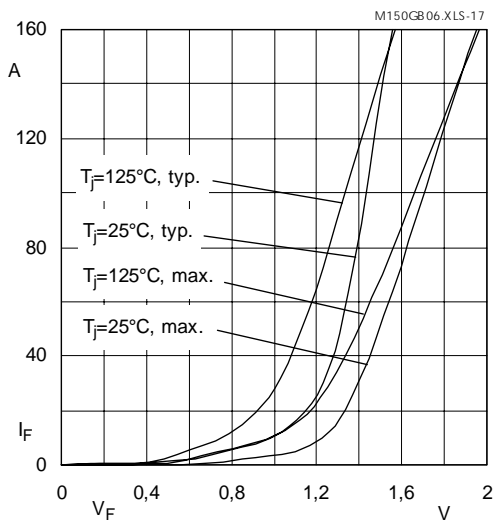


Fig. 17 Typ. CAL diode forward characteristic

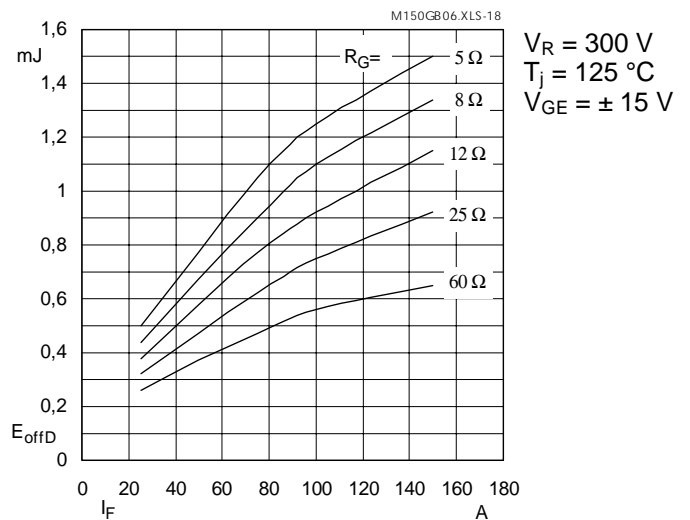


Fig. 18 Diode turn-off energy dissipation per pulse

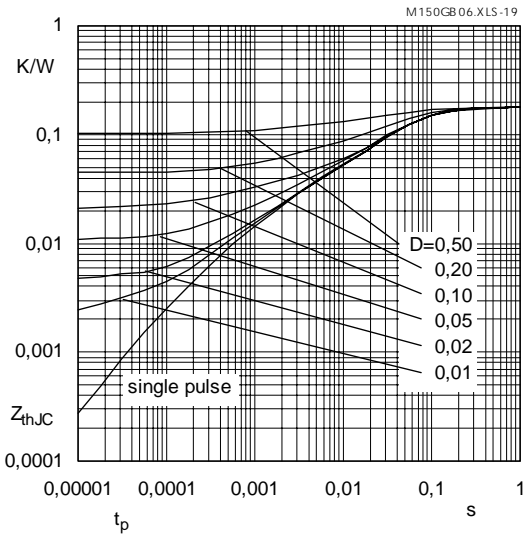


Fig. 19 Transient thermal impedance of IGBT  
 $Z_{thJC} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$

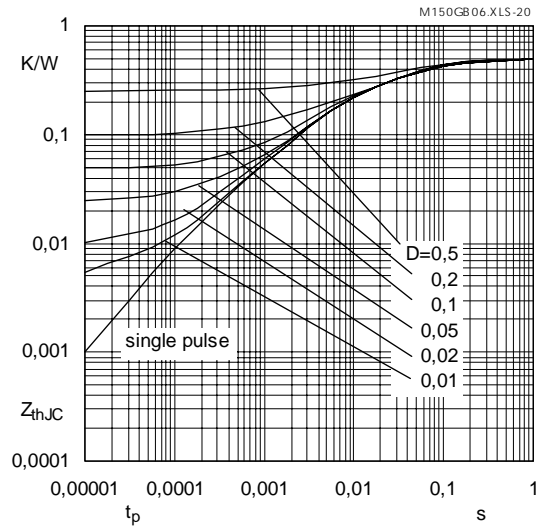


Fig. 20 Transient thermal impedance of inverse CAL diodes  
 $Z_{thJC} = f(t_p)$ ;  $D = t_p / t_c = t_p \cdot f$

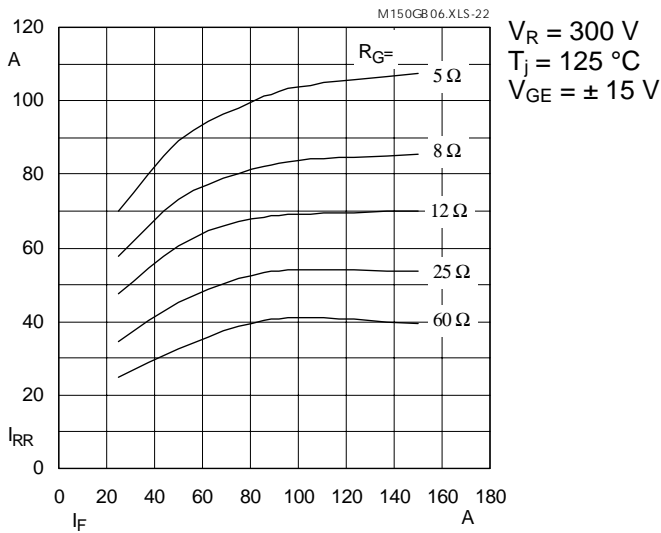


Fig. 22 Typ. CAL diode peak reverse recovery current  $I_{RR} = f(I_F; R_G)$

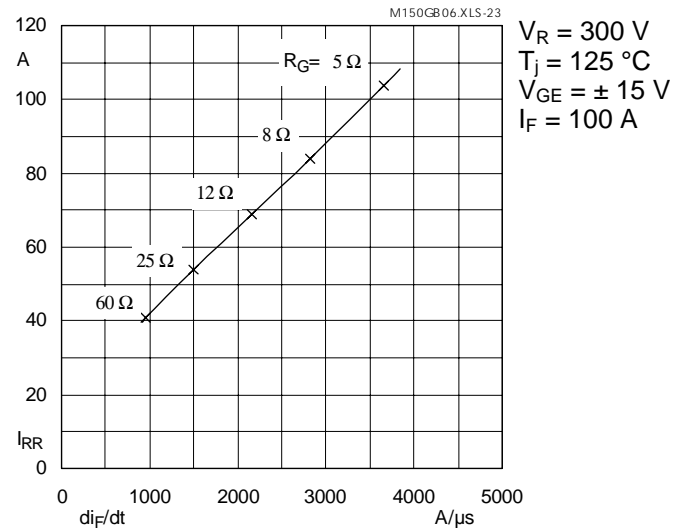
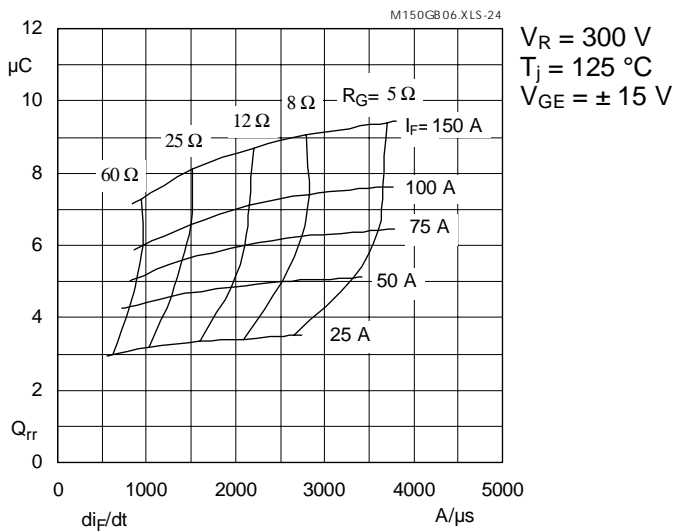


Fig. 23 Typ. CAL diode peak reverse recovery current  $I_{RR} = f(di/dt)$

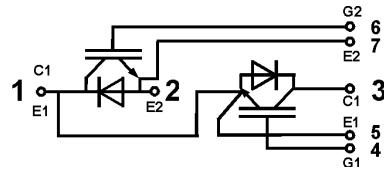
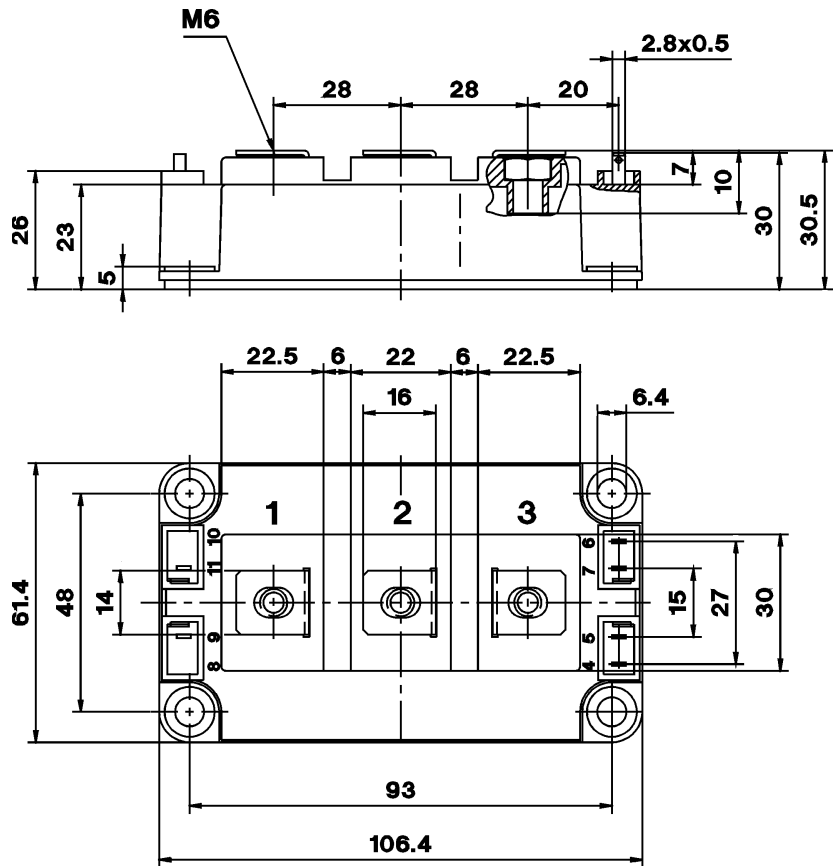


**SEMITRANS 3**

**Case D 56**

UL Recognized

File no. E 63 532



Dimensions in mm

Case outline and circuit diagram

Mechanical Data		Values			Units
Symbol	Conditions	min.	typ.	max.	
M <sub>1</sub>	to heatsink, SI Units(M6) to heatsink, US Units	3	—	5	Nm lb.in.
M <sub>2</sub>	for terminals, SI Units(M6) for terminals, US Units	2,5	—	5	Nm lb.in.
a		—	—	5x9,81	m/s <sup>2</sup>
w		—	—	325	g

**This is an electrostatic discharge sensitive device (ESDS). Please observe the international standard IEC 747-1, Chapter IX.**

Three devices are supplied in one SEMIBOX A without mounting hardware, which can be ordered separately under Ident No. 33321100 (for 10 SEMITRANS 3)

Larger packing units of 12 or 20 pieces are used if suitable  
Accessories → B 6 – 4  
SEMIBOX → C - 1.